AGRIUM (PWS 6150018)
SOURCE WATER ASSESSMENT FINAL REPORT

February 4, 2003

State of Idaho
Department of Environmental Quality

Executive Summary

Under the Safe Drinking Water Act Amendments of 1996, all states are required by the U.S. Environmental Protection Agency (EPA) to assess every source of public drinking water for its relative sensitivity to contaminants regulated by the act. This assessment is based on a land use inventory of the designated assessment areas and sensitivity factors associated with the well and the aquifer characteristics.

This report, *Source Water Assessment for Agrium, Soda Springs, Idaho*, describes the public water system (PWS), the boundaries of the zones of water contribution, and the associated potential contaminant sources located within these boundaries. This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. **The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the water system.**

Agrium (PWS # 6150018) is a non-community, non-transient drinking water system located in Caribou County. The Agrium drinking water system is made up of three ground water wells: an upper shop well and two private wells (the lower shop well known as the L Well and the Lab Well). The New Well (formerly known as the upper shop well) is the main well of the system and was constructed in 1990. It is located approximately seven miles south of Wayan, nine miles east of Highway 34, along the Rasmussen Ridge. The L Well was constructed in 1968 and is located approximately five miles directly south of the New Well. The Lab Well is the oldest well, constructed in 1967 and is located nearly a mile northwest of the L Well and approximately four miles southwest of the New Well. The Lab Well and the L Well are both located in the Wooley Valley, approximately seven miles east of Highway 34. The New Well supplies drinking water to the Agrium office at 500 gallons per day (gpd). According to the PWS questionnaire, the L Well supplies water to the system for three months of the year at up to 100 gpd and is inoperative for the remaining nine months. Based on operator information provided and the Washington Group International report (WGI, 2002), the Lab Well is not used. The water system serves approximately 100 persons through three connections.

The potential contaminant sources within the delineation capture zones of the wells are a jeep trail near the New Well, the Blackfoot River Road, the Blackfoot River, a mining railroad near the L Well, a jeep trail, and an intermittent stream within 200 feet of the Lab Well. Additionally, the 1999 sanitary survey identified a driveway within 10 feet of the New Well. If an accidental spill occurred into any of these corridors, inorganic chemical (IOC) contaminants, volatile organic chemical (VOC) contaminants, synthetic organic chemical (SOC) contaminants, or microbial contaminants could be added to the aquifer systems. Although the Rasmussen Ridge mine is not included in the delineation capture zones of the New Well, an Environmental Site Assessment (ESA) of the mining operation completed by Whetstone Associates in December 2002 indicates that the water quality of the New Well can potentially be affected by the activities and characteristics associated with the Rasmussen Ridge mine. This mining site can potentially add IOC contaminants, VOC contaminants, and SOC contaminants to the aquifer.

Final well susceptibility scores are derived from equally weighting potential contaminant inventory/land use scores and adding them with hydrologic sensitivity scores and system construction scores. Therefore, a low rating in one category coupled with a higher rating in another category result in a final rating of low, moderate, or high susceptibility. Potential contaminants are divided into four categories: IOCs (i.e., nitrates, arsenic), VOCs (i.e., petroleum products), SOCs (i.e., pesticides), and microbial contaminants (i.e., bacteria). As a water source can be subject to various contamination settings, separate scores are given for each type of contaminant.

For the assessment, a review of laboratory tests was conducted using the State Drinking Water Information System (SDWIS). Three detections of total coliform bacteria have been recorded in the system, none of which were found at the wellheads. No SOCs or VOCs have been detected in the well water. The IOCs barium, cadmium, fluoride, nitrate, and selenium have been detected in the well water but at concentrations below the maximum contaminant level (MCL) for each chemical, as established by the EPA.

In terms of total susceptibility, the L Well and the Lab Well rated moderate for IOCs, VOCs, SOCs, and microbial contaminants. The New Well rated automatically high for IOCs, VOCs, SOCs, and microbial contaminants due to a driveway that runs within 10 feet of the wellhead. A recent sanitary survey and a well log of the New Well included system construction information. However, very little information was provided for the system construction concerning the L Well and the Lab Well. Additionally, no well logs were available for the L Well and the Lab Well, contributing to the high hydrologic sensitivity scores for both wells, and the high system construction score for the L Well. Hydrologic sensitivity and system construction scores for the New Well were moderate. The potential contaminant land use scores were low for IOCs, VOCs, SOCs, and microbials for all of the wells due to the limited number of potential contaminants and lack of agricultural land within the delineations.

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a “pristine” area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed source water protection program will incorporate many strategies. For Agrium, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey (an inspection conducted every five years with the purpose of determining the physical condition of a water system’s components and its capacity). The system should assure that their wells are properly protected from surface flooding (e.g., vented, screened, and downturned casings that extend 18 inches above ground surface). Attention should also be given to the driveway that runs within 10 feet of the New Well to avoid contamination of the well associated with this corridor. As land uses within most of the source water assessment areas are outside the direct jurisdiction of Agrium, collaboration and partnerships with state and local agencies and industry groups should be established and are critical to success. Educating employees and the public about source water will further assist the system in its monitoring and protection efforts.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include household hazardous waste disposal methods and the importance of water conservation. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Caribou County Soil Conservation District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (e.g., zoning, permitting) or non-regulatory in nature (i.e., good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the Idaho Department of Environmental Quality or the Idaho Rural Water Association.

SOURCE WATER ASSESSMENT FOR AGRIUM, SODA SPRINGS, IDAHO

Section 1. Introduction - Basis for Assessment

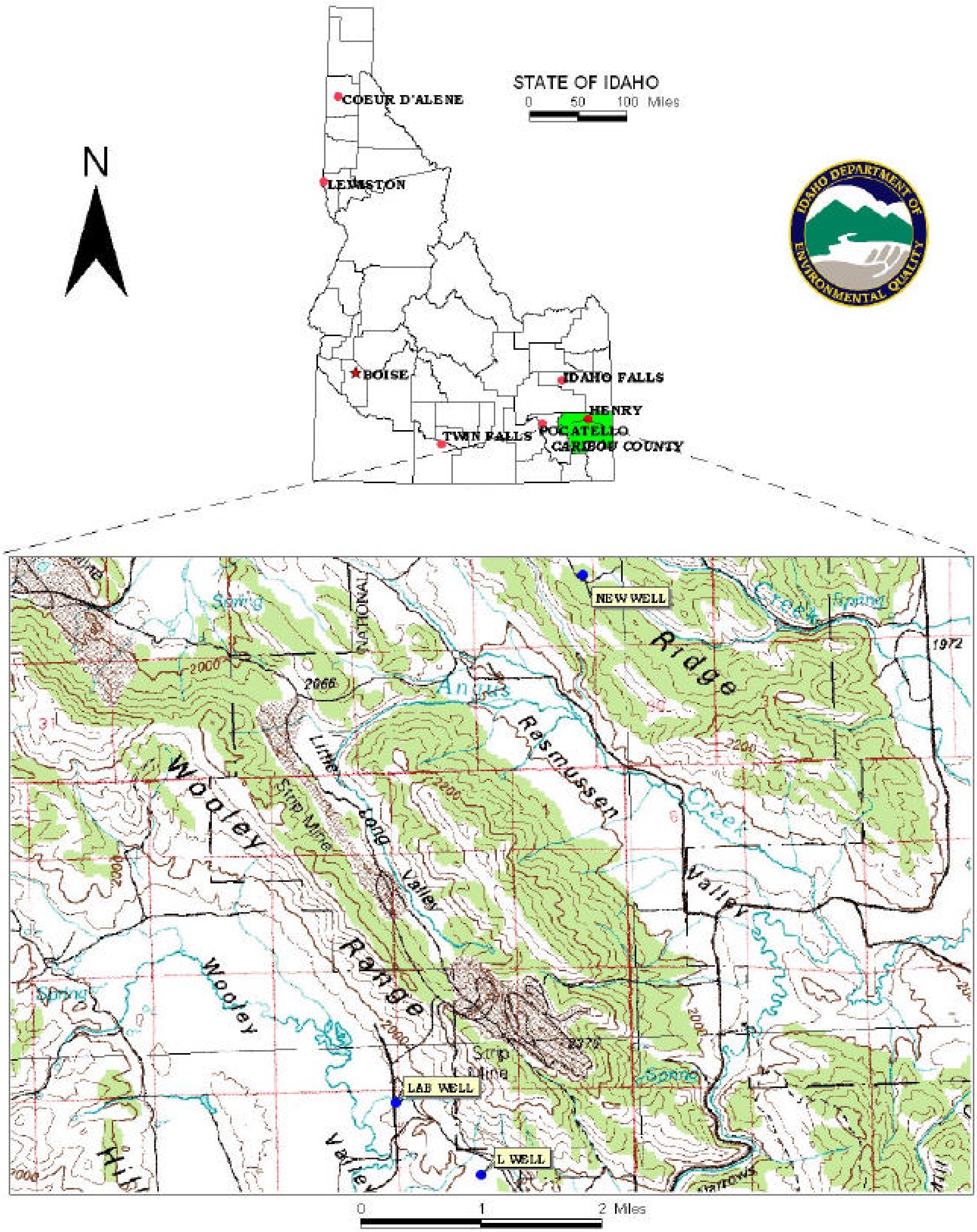
The following sections contain information necessary to understand how and why this assessment was conducted. **It is important to review this information to understand what the ranking of this assessment means.** Maps showing the delineated source water assessment area and the inventory of significant potential sources of contamination identified within that area are included. The list of significant potential contaminant source categories and their rankings used to develop the assessment also is included.

Level of Accuracy and Purpose of the Assessment

The Idaho Department of Environmental Quality (DEQ) is required by the U.S. Environmental Protection Agency (EPA) to assess over 2,900 public drinking water sources in Idaho for their relative susceptibility to contaminants regulated by the Safe Drinking Water Act. This assessment is based on a land use inventory of the delineated assessment area, sensitivity factors associated with the well, and aquifer characteristics. All assessments must be completed by May of 2003. The resources and time available to accomplish assessments are limited. Therefore, an in-depth, site-specific investigation to identify each significant potential source of contamination for every public water supply system is not possible. **This assessment should be used as a planning tool, taken into account with local knowledge and concerns, to develop and implement appropriate protection measures for this source. The results should <u>not be</u> used as an absolute measure of risk and they should <u>not be</u> used to undermine public confidence in the public water system (PWS).**

The ultimate goal of the assessment is to provide data to local communities to develop a protection strategy for their drinking water supply system. DEQ recognizes that pollution prevention activities generally require less time and money to implement than treatment of a public water supply system once it has been contaminated. DEQ encourages communities to balance resource protection with economic growth and development. The decision as to the amount and types of information necessary to develop a drinking water protection program should be determined by the local community based on its own needs and limitations. Wellhead or drinking water protection is one facet of a comprehensive growth plan, and it can complement ongoing local planning efforts.

FIGURE 1. Geographic Location of Agrium



Section 2. Conducting the Assessment

General Description of the Source Water Quality

Agrium (PWS # 6150018) is a non-community, non-transient drinking water system located in Caribou County (see Figure 1). The Agrium drinking water system is made up of three ground water wells: an upper shop well and two private wells (the lower shop well known as the L Well and the Lab Well). The New Well (formerly known as the upper shop well) is the main well of the system constructed in 1990. It is located approximately seven miles south of Wayan, nine miles east of Highway 34, along the Rasmussen Ridge. The L Well was constructed in 1968 and is located approximately five miles directly south of the New Well. The Lab Well is the oldest well, constructed in 1967 and is located nearly a mile northwest of the L Well and approximately 4 miles southwest of the New Well. The Lab Well and the L Well are both located in the Wooley Valley, approximately seven miles east of Highway 34. The New Well supplies drinking water to the office at 500 gallons per day (gpd). According to the PWS questionnaire, the L Well supplies water to the system for three months of the year at up to 100 gpd and is inoperative for the remaining nine months. From operator information provided and the Washington Group International (WGI, 2002) report, the Lab Well is not used. The water system serves approximately 100 persons through three connections.

Three detections of total coliform bacteria have been recorded in the system, none of which were found at the wellheads. No synthetic organic chemicals (SOCs) or volatile organic chemicals (VOCs) have been detected in the well water. The inorganic chemicals (IOCs) barium, cadmium, fluoride, nitrate, and selenium have been detected in the well water but at concentrations below the maximum contaminant level (MCL) for each chemical, as established by the EPA.

Defining the Zones of Contribution – Delineation

The delineation process establishes the physical area around a well that will become the focal point of the assessment. The process includes mapping the boundaries of the zone of contribution into time-of-travel (TOT) zones (zones indicating the number of years necessary for a particle of water to reach a well) for water in the aquifer. WGI was contracted by DEQ to define the PWS's zones of contribution. WGI used a calculated fixed radius model approved by the Source Water Assessment Plan (DEQ, 1999) in determining the 3-year (Zone 1B), 6-year (Zone 2), and 10-year (Zone 3) TOT zones for water associated with the "None" hydrologic province in the vicinity of the New Agrium well and the "Upper Blackfoot" hydrologic province in the vicinity of the Agrium L and Lab wells. The computer model used site specific data, assimilated by WGI from a variety of sources including operator records and hydrogeologic reports. A summary of the hydrogeologic information from the WGI is provided below. Following the addition of new ground water information regarding the Rasmussen Ridge (Bureau of Land Management (BLM), 2002), the New Agrium well delineation was updated.

Hydrogeologic Conceptual Model

The mountains and valleys within the “None” and the “Upper Blackfoot” hydrologic provinces were formed during two events separated by approximately 50 to 70 million years (Alt and Hyndman, 1989, pp. 329 and 336). The overthrust belt of the northern Rocky Mountains was formed roughly 70 to 90 million years ago through the intrusion of granitic magma and a massive eastward movement of large slabs of layered sedimentary rocks along faults that dip shallowly westward (Alt and Hyndman, 1989, p. 329). This movement caused extreme folding and fracturing of the sedimentary and granitic rocks and, in many cases, left older formations lying on top of younger ones. Later Basin and Range block faulting broke up the largely eroded Rocky Mountains into large uplifted and downthrown blocks resulting in the present day northwest trending mountains and valleys seen throughout southeast Idaho. Paleozoic and Precambrian limestone, dolomite, sandstone, shale, siltstone, and quartzite are the predominant materials forming the mountains and probably compose the bedrock underlying the valleys between Salmon, Idaho on the north side of the Snake River Plain and Franklin, Idaho near the Utah/Idaho border (Dion, 1969, p.18; Kariya et al., 1994, p. 6; Bjorklund and McGreevy, 1971, p. 12; and Parliman, 1982, p. 9).

Ground water movement in the mountains is primarily through a system of solution channels, fractures and joints that commonly transmit water independently of surface topography (Bjorklund and McGreevy, 1971, p. 15; Dion, 1969, p. 18). Ralston and others (1979, pp. 128-129) state that the geologic structural features also can contribute to the development of cross-basin ground water flow systems. Ground water entering a geologic formation tends to follow the formation because hydraulic conductivities are greater parallel to the bedding planes than across them. Synclines and anticlines provide structural avenues for ground water flow under ridges from one valley to another.

“None” Hydrologic Province

Graham and Campbell (1981) identified and described 70 regional ground water systems throughout Idaho. Thirty-four of these fall within the southeastern part of the state. The “None” hydrologic province, as defined in this report, includes all the area outside of the 34 regional systems in southeast Idaho. The smaller and more localized aquifers in the “None” province typically are situated in the foothills and mountains that surround and recharge the regional ground water systems.

The average annual precipitation in the mountains of southeast Idaho ranges from 20 inches on ridges near Soda Springs to over 45 inches on the Bear River Range (Ralston and Trihey, 1975, p. 7, and Dion, 1969, p. 11). The valleys receive an average of 7 to 10 inches annually (Donato, 1998, p. 3, and Dion, 1969, p. 11). Precipitation and seepage from streams are the primary source of recharge to the mountain aquifers (Kariya, et al., 1994, p. 18, and Parliman, 1982, p. 13).

Ground water discharge occurs as springs and seeps issuing from faults, fractures, and solution channels and as underflow to regional aquifers. The Bear River Basin in the far southeast corner of the state contains hundreds of springs issuing primarily from fractures and solution openings in the bedrock mountains (Dion, 1969, p. 47, and Bjorklund and McGreevy, 1971, pp. 34-35). Within Cache Valley many springs discharge from the valley-fill deposits (Kariya et al., 1994, p. 32).

There is little available information on the distribution of hydraulic head and the hydraulic properties of the aquifers in the "None" hydrologic province. No U.S. Geological Survey (2001) or Idaho Statewide Monitoring Network (Neely, 2001) wells are located in the areas of concern to provide information on ground water flow direction and hydraulic gradient or to aid in model calibration. The information that is available indicates that the hydraulic properties are quite variable, even within a specific rock type. Ralston and others (1979, p. 31), for example, present hydraulic conductivity estimates for fractured chert ranging from 2.2 to 75 feet per day (ft/day). Estimates for phosphatic shale are as low as 0.07 ft/day (unfractured) and as high as 25 ft/day (fractured).

"Upper Blackfoot" Hydrologic Province

The Upper Blackfoot hydrologic province is southwest trending with northwest and southeast trending finger-like projections. The principal aquifers are unconsolidated valley-fill materials and the underlying Dinwoody, Phosphoria, and Wells Formations made up of limestone, sandstone, siltstone, dolomite, chert, and shale (BLM, 2000, p. 3-46; Graham and Campbell, 1981, p. 21; and Ralston et al. 1979, p. 26).

Graham and Campbell (1981, p. 21) list the major sources of aquifer recharge in the Upper Blackfoot hydrologic province as percolation of precipitation and snowmelt into the alluvium, infiltration into the outcrop areas of bedrock formations, and leakage from tributaries to the Blackfoot River. They also state that in places the alluvial aquifers recharge the bedrock aquifers, while in other areas the alluvium is recharged by the bedrock aquifers. Ground water discharge also occurs as springs and seeps issuing from faults, fractures, and solution channels, and as underflow to adjacent aquifers.

The geology in the region surrounding the Agrium PWS wells (L and Lab wells) is significantly complicated. The bedrock east of the Agrium PWS wells in the Wooley Valley dips to the east at about 35 to 45 degrees as part of the Wooley Valley anticline (Ralston, 1990; written communication to W. Johnson; and Oberlindacher, 1990). The L Well is located between the axis of the Schmid syncline to the southwest and the Wooley Valley anticline to the northeast (Oberlindacher, 1990). Numerous north-south and east-west trending faults, including the Blackfoot fault, lie between the L Well and the axis of the Wooley Valley anticline. Moving east from the Wooley Valley anticline, several northwest trending thrust faults are encountered, then the Woody Ridge syncline, and then several more thrust faults are encountered. The Lab Well is located near the intercept of the east-west trending Blackfoot fault and the axis of the Schmid syncline.

Figure III-4 in Ralston et al. (1979, p. 33) indicates that precipitation falling on the upper western slope of the Wooley Range flows eastward along the west limb of a syncline and discharges to the east in the outcrop of the east limb along a fault in Rasmussen Valley. Precipitation that infiltrates on the eastern slope of the Wooley Range is part of a shallower flow system that discharges in Little Long Valley between Wooley and Rasmussen valleys. No information is available on ground water flow direction within the Wooley Valley.

Calculated Fixed-Radius Delineation Method

The calculated fixed-radius method (IDEQ, 1997 p. 4-9) was used to delineate capture zones for all of the PWS wells in the "None" hydrologic province and the Agrium L and Lab wells in the "Upper Blackfoot" hydrologic province. The fixed radii for the 3-, 6-, and 10-year TOT capture zones were calculated using equations presented by Keely and Tsang (1983) for the velocity distribution surrounding a pumping well.

Based on information included in the Environmental Site Assessment (ESA) "Draft Water Resources Technical Report for the Proposed North Rasmussen Ridge Mine Expansion", the calculated fixed-radius delineation for the New Well was modified to reflect ground water flow direction.

The New Agrium Well is completed in a chert aquifer. The WGI capture zone radii were calculated using a hydraulic conductivity of 8.6 feet per day (ft/day). The hydraulic conductivity is the geometric mean of estimates for the Rex Chert aquifer in the Upper Blackfoot hydrologic province (WGI, 2002a). The effective porosity (0.2) and hydraulic gradient (0.003) are the default values presented in Table F-3 of the Idaho Wellhead Protection Plan for mixed volcanic and sedimentary rocks, primarily sedimentary rocks (IDEQ, 1997, p F-6). The aquifer thickness is the saturated open interval of the well. The pumping rate is 1.5 times the average daily pumping rate. Based on new ground water information for the Rasmussen Ridge (BLM, 2002), the capture zone was reevaluated using local conditions. The new delineation was based on a hydraulic conductivity of 8.2 ft/day, an effective porosity of 0.1, and a hydraulic gradient of 0.0057.

The calculated-fixed radius delineation method was used for the Agrium L and Lab wells in the "Upper Blackfoot" hydrologic province because of uncertainty regarding the ground water flow direction and the hydraulic gradient distribution in the area. While Ralston et al. (1979, p. 33) indicate an eastward ground water flow direction east of the PWS wells, it is not clear which geologic formations this occurs in or whether this pattern of flow extends down the western slope of the Wooley Range and into the Wooley Valley.

The pumping rate for the Agrium L Well is 1.5 times the average daily pumping rate. The Lab Well was assumed to be a backup well and pumped at the same rate as the L Well. The hydraulic conductivity of 89 ft/day is based on a reported transmissivity of 3,300 square feet per day (ft^2/day) (25,000 gallons/day/feet) and an assumed aquifer thickness of 37.5 feet.

Application of the final calculated fixed-radius method to PWS wells in the "None" hydrologic province resulted in circular delineations ranging from 9.1 to 971 acres in total area. For the New Agrium Well, the total area of the ellipsoidal delineation is 55 acres.

Fixed-radius calculations for the Agrium wells in the "Upper Blackfoot" hydrologic province also resulted in circular delineations. The total areas for the L Well and the Lab Well are 1,722 acres and 1,727 acres respectively.

The delineated source water assessment area for the Agrium Lab and L wells can be described as three concentric circles. Fixed-radius calculations for the Lab Well resulted in radial distances of 1,478, 2,943, and 4,894 feet for the 3-, 6-, and 10-year TOT, respectively (see Figure 3, Appendix A). Fixed-radius calculations for the L Well resulted in radial distances of 1,471, 2,935, and 4,886 feet for the 3-, 6-, and 10-year TOT respectively (see Figure 2, Appendix A).

The delineation area for the New Well is based on an ellipse, with the 3-year TOT having a long axis in the down-valley direction of 700 feet, a 6-year TOT having a long axis of 1,288 feet , and a 10-year TOT having a long axis of 2,047 feet (see Figure 4, Appendix A). The actual data used by WGI and DEQ in determining the source water assessment delineation areas is available from DEQ upon request.

Identifying Potential Sources of Contamination

A potential source of contamination is defined as any facility or activity that stores, uses, or produces, as a product or by-product, the contaminants regulated under the Safe Drinking Water Act. Furthermore, these sources have a sufficient likelihood of releasing such contaminants into the environment at levels that could pose a concern relative to drinking water sources. The goal of the inventory process is to locate and describe those facilities, land uses, and environmental conditions that are potential sources of ground water contamination. Field surveys conducted by DEQ and reviews of available databases identified a jeep trail with the 6-year and 10-year TOT zones and an intermittent creek within 200 feet of the Lab Well, a mining railroad, the Blackfoot River Road, and the Blackfoot River within the 10-year TOT zone of the L Well, and a jeep trail within the 6-year and 10-year TOT zones and a driveway within 10 feet of the New Well as potential contaminant sources within the delineated areas (see Table A-1, Table A-2, and Table A-3 in Appendix A). Additionally, although the Rasmussen Ridge mine is not included in the delineation capture zones of the New Well, an ESA of the mining operation completed for the BLM in December 2002 indicates that the water quality of the New Well can potentially be affected by the activities and characteristics associated with the Rasmussen Ridge mine (see Table A-3, Appendix A).

It is important to understand that a release may never occur from a potential source of contamination provided they are using best management practices. Many potential sources of contamination are regulated at the federal level, state level, or both, to reduce the risk of release. Therefore, when a business, facility, or property is identified as a potential contaminant source, this should not be interpreted to mean that this business, facility, or property is in violation of any local, state, or federal environmental law or regulation. What it does mean is that the <u>potential</u> for contamination exists due to the nature of the business, industry, or operation. There are a number of methods that water systems can use to work cooperatively with potential sources of contamination, including educational visits and inspections of stored materials. Many owners of such facilities may not even be aware that they are located near a public water supply source.

Contaminant Source Inventory Process

A two-phased contaminant inventory of the study area was conducted in August and September 2002. The first phase involved identifying and documenting potential contaminant sources within the Agrium source water assessment area through the use of computer databases, sanitary surveys, and Geographic Information System (GIS) maps developed by DEQ. The second, or enhanced, phase of the contaminant inventory involved contacting the operator to identify and add any additional potential sources in the delineated areas. This was done with the assistance of Rob Squires and Chuck Jessell. At the time of the enhanced inventory, no additional potential contaminant sources were found within the delineated source water areas. Maps with the well locations, delineated areas, and potential contaminant sources are provided with this report (see Figure 2, Figure 3, and Figure 4 in Appendix A). The potential contaminant sources have been listed in Table A-1, Table A-2, and Table A-3 in Appendix A.

Section 3. Susceptibility Analyses

The wells' susceptibility to contamination was ranked as high, moderate, or low risk according to the following considerations: hydrologic sensitivity, well construction, land use characteristics, and potentially significant contaminant sources. The susceptibility rankings are specific to a particular potential contaminant or category of contaminants. Therefore, a high susceptibility rating relative to one potential contaminant does not mean that the water system is at the same risk for all other potential contaminants. The relative ranking that is derived for the wells is a qualitative, screening-level step that, in many cases, uses generalized assumptions and best professional judgement. Appendix B contains the susceptibility analysis worksheets. The following summaries describe the rationale for the susceptibility ranking.

Hydrologic Sensitivity

The hydrologic sensitivity of a well is dependent upon four factors. These factors are surface soil composition, the material in the vadose zone (between the land surface and the water table), the depth to first ground water, and the presence of a 50-foot thick fine-grained zone (aquitard) above the producing zone of the well. Slowly draining soils such as silt and clay have better filtration capabilities and therefore are typically more protective of ground water than coarse-grained soils such as sand and gravel. Similarly, fine-grained sediments in the subsurface and a water depth of more than 300 feet protect the ground water from contamination.

Hydrologic sensitivity was rated high for the L Well and the Lab Well and rated moderate for the New Well (see Table 1). This is based upon moderate to well drained soil classes as defined by the National Resource Conservation Service (NRCS). Well logs were not available for the L Well or for the Lab Well, prohibiting a determination of the composition of the vadose zone, depth to first ground water, and the presence of low permeability units that help to reduce the downward movement of contaminants. When no information is available, a higher, more conservative, score is given. The well log for the New Well indicates that the vadose zone is composed mostly of clay layers and that several clay layers exist above the producing zone, forming an aquitard. Clay is a soil type that tends to impede the downward movement of contaminants to the aquifer. First ground water for the New Well was found at a shallow depth between 20 feet and 25 feet below ground surface (bgs).

Well Construction

Well construction directly affects the ability of the well to protect the aquifer from contaminants. System construction scores are reduced when information shows that potential contaminants will have a more difficult time reaching the intake of the well. Lower scores imply a system is less vulnerable to contamination. For example, if the well casing and annular seal both extend into a low permeability unit, then the possibility of contamination is reduced and the system construction score goes down. If the highest production interval is more than 100 feet below the water table, then the system is considered to have better buffering capacity. If the wellhead and surface seal are maintained to standards, as outlined in sanitary surveys, then contamination down the well bore is less likely. If the well is protected from surface flooding and is outside the 100-year floodplain, then contamination from surface events is reduced.

The system construction scores were rated high vulnerability for the L Well and moderate for the Lab Well and the New Well (see Table 1). The 1999 sanitary survey only pertains to the New Well. It states that the wellhead and surface seals are maintained to standards but that the wellhead does not have a well casing vent.

The purpose of the vent is to vent the space between the casing and the column and prevent a vacuum from forming when the well turns on and draws down the water table. A vacuum could draw in contamination through joints or leaks in the casing or cause the well to slough. All of the Agrium wells are located outside a 100-year floodplain.

Well logs for the L Well and the Lab Well were unavailable, preventing a determination of the placement of the annular seal and the casing and the thickness and diameter of the casing. The well log for the New Well indicates that the well was drilled in 1990 to a depth of 302 feet bgs and has a 0.375-inch thick, 16-inch diameter casing set to 292 feet bgs into shale. The annular seal extends to 40 feet bgs into a layer of clay. The static water level is found at 18 feet bgs and the highest production zone of the New Well is found between 76 feet and 270 feet bgs.

The PWS questionnaires that were sent to the operator as a part of the enhanced phase of the contaminant inventory provided some useful well construction information concerning the Lab Well. The highest production interval of the Lab Well is more than 100 feet below the water table. The static water level of the Lab Well is found at 30 feet bgs and the casing of the Lab Well is screened between 190 and 195 feet bgs.

The Idaho Department of Water Resources (IDWR) *Well Construction Standards Rules (1993)* require all PWSs to follow DEQ standards. IDAPA 58.01.08.550 requires that PWSs follow the *Recommended Standards for Water Works (1997)* during construction. Under current standards, all PWS wells are required to have a 50-foot buffer around the wellhead and if the well is designed to yield greater than 50 gallons per minute (gpm) a minimum of a 6-hour pump test is required. These standards are used to rate the system construction for the well by evaluating items such as condition of wellhead and surface seal, whether the casing and annular space is within consolidated material or 18 feet below the surface, the thickness of the casing, etc. If all criteria are not met, the public water source does not meet the IDWR Well Construction Standards. In this case, there was insufficient information available to determine if the L Well and the Lab Well meet all the criteria outlined in the IDWR Well Construction Standards. A 2-hour pump test was performed on the New Well, yielding 75 gpm. However, the minimum time for a pump test yielding greater than 50 gpm is 6 hours. Therefore, the New Well did not meet IDWR Well Construction Standards.

Potential Contaminant Source and Land Use

The potential contaminant sources and land use within the delineated zones of water contribution are assessed to determine the well's susceptibility. When agriculture is the predominant land use in the area, this may increase the likelihood of agricultural wastewater infiltrating the ground water system. Agricultural land is counted as a source of leachable contaminants and points are assigned to this rating based on the percentage of agricultural land. The land use within the area surrounding the Agrium wells is predominately rangeland.

In terms of potential contaminant sources, the Agrium wells rated low vulnerability for IOCs (i.e., nitrates), VOCs, (i.e., petroleum related products), SOCs (i.e., pesticides), and microbials (i.e., fecal coliform) (see Table 1).

Potential contaminant sources found within the delineated areas include a mining railroad, the Blackfoot River Road, and the Blackfoot River near the L Well, a jeep trail and an intermittent stream near the Lab Well, and a jeep trail and the Rasmussen Ridge Mining operation near the New Well. The location of these potential contaminant sources and delineated TOT zones for the wells are shown on Figure 2, Figure 3, and Figure 4. Not shown on Figure 4 but listed in Table A-3, the 1999 sanitary survey identified a driveway within 10 feet of the New Well.

Final Susceptibility Ranking

A detection above a drinking water standard MCL or any detection of a VOC or SOC will automatically give a high susceptibility rating to the well, despite the land use of the area, because a pathway for contamination already exists. Additionally, potential contaminant sources within 50 feet of a well will automatically lead to a high susceptibility rating. The driveway within 10 feet of the New Well resulted in automatically high susceptibility ratings to all potential contaminants. Having multiple potential contaminant sources in the 0- to 3-year TOT zone (Zone 1B) contribute greatly to the overall ranking.

Table 1. Summary of Agrium Susceptibility Evaluation

Drinking Water Source	Susceptibility Scores[1]									
	Hydrologic Sensitivity	Potential Contaminant Inventory and Land Use				System Construction	Final Susceptibility Ranking			
		IOC	VOC	SOC	Microbials		IOC	VOC	SOC	Microbials
L Well	H	L	L	L	L	H	M	M	M	M
Lab Well	H	L	L	L	L	M	M	M	M	M
New Well	M	L	L	L	L	M	H*	H*	H*	H*

[1]H = High Susceptibility, M = Moderate Susceptibility, L = Low Susceptibility,
IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical
H* = Automatic high score due to a driveway within 10 feet of the wellhead

Susceptibility Summary

In terms of total susceptibility, the L Well and the Lab Well rated moderate for IOCs, VOCs, SOCs, and microbial contaminants. The New Well rated automatically high for IOCs, VOCs, SOCs, and microbial contaminants due to a driveway that runs within 10 feet of the wellhead. A recent sanitary survey and a well log of the New Well included system construction information. However, very little information was provided for the system construction concerning the L Well and the Lab Well. Additionally, no well logs were available for the L Well and the Lab Well, contributing to the high hydrologic sensitivity scores for both wells, and the high system construction score for the L Well. Hydrologic sensitivity and system construction scores for the New Well were moderate. The potential contaminant land use scores were low for IOCs, VOCs, SOCs, and microbials for all of the wells due to the limited number of potential contaminants and lack of agricultural land within the delineations.

Three detections of total coliform bacteria have been recorded in the system. No SOCs or VOCs have been detected in the well water. The IOCs barium, cadmium, fluoride, nitrate, and selenium have been detected in the well water but at concentrations below the MCL for each chemical, as established by the EPA.

Section 4. Options for Drinking Water Protection

This assessment should be used as a basis for determining appropriate new protection measures or re-evaluating existing protection efforts. No matter what ranking a source receives, protection is always important. Whether the source is currently located in a "pristine" area or an area with numerous industrial and/or agricultural land uses that require surveillance, the way to ensure good water quality in the future is to act now to protect valuable water supply resources. If the system should need to expand in the future, new well or spring sites should be located in areas with as few potential sources of contamination as possible, and the site should be reserved and protected for this specific use.

An effective drinking water protection program is tailored to the particular local drinking water protection area. A community with a fully developed source water protection program will incorporate many strategies. For Agrium, drinking water protection activities should first focus on correcting any deficiencies outlined in the sanitary survey. The system should assure that their wells are properly protected from surface flooding (e.g., vented, screened, and downturned casings that extend 18 inches above ground surface). Attention should also be given to the driveway that runs within 10 feet of the New Well to avoid contamination of the well associated with this corridor. As land uses within most of the source water assessment areas are outside the direct jurisdiction of Agrium, collaboration and partnerships with state and local agencies and industry groups should be established and are critical to success. Educating employees about source water will further assist the system in its monitoring and protection efforts.

Due to the time involved with the movement of ground water, drinking water protection activities should be aimed at long-term management strategies even though these strategies may not yield results in the near term. A strong public education program should be a primary focus of any drinking water protection plan. Public education topics could include household hazardous waste disposal methods and the importance of water conservation. There are multiple resources available to help communities implement protection programs, including the Drinking Water Academy of the EPA. Drinking water protection activities for agriculture should be coordinated with the Idaho State Department of Agriculture, the Caribou County Soil Conservation District, and the Natural Resources Conservation Service.

A community must incorporate a variety of strategies in order to develop a comprehensive drinking water protection plan, be they regulatory in nature (e.g., zoning, permitting) or non-regulatory in nature (i.e., good housekeeping, public education, specific best management practices). For assistance in developing protection strategies please contact the Pocatello Regional Office of the DEQ or the Idaho Rural Water Association.

Assistance

Public water supplies and others may call the following DEQ offices with questions about this assessment and to request assistance with developing and implementing a local protection plan. In addition, draft protection plans may be submitted to the DEQ office for preliminary review and comments.

Pocatello Regional DEQ Office	(208) 236-6160
State DEQ Office	(208) 373-0502

Website: http://www.deq.state.id.us

Water suppliers serving fewer than 10,000 persons may contact Melinda Harper (mlharper@idahoruralwater.com), Idaho Rural Water Association, at (208) 343-7001 for assistance with drinking water protection (formerly wellhead protection) strategies.

POTENTIAL CONTAMINANT INVENTORY LIST OF ACRONYMS AND DEFINITIONS

AST (Aboveground Storage Tanks) – Sites with aboveground storage tanks.

Business Mailing List – This list contains potential contaminant sites identified through a yellow pages database search of standard industry codes (SIC).

CERCLA – This includes sites considered for listing under the **Comprehensive Environmental Response Compensation and Liability Act (CERCLA)**. CERCLA, more commonly known as Superfund is designed to clean up hazardous waste sites that are on the national priority list (NPL).

Cyanide Site – DEQ permitted and known historical sites/facilities using cyanide.

Dairy – Sites included in the primary contaminant source inventory represent those facilities regulated by Idaho State Department of Agriculture (ISDA) and may range from a few head to several thousand head of milking cows.

Deep Injection Well – Injection wells regulated under the Idaho Department of Water Resources generally for the disposal of stormwater runoff or agricultural field drainage.

Enhanced Inventory – Enhanced inventory locations are potential contaminant source sites added by the water system. These can include new sites not captured during the primary contaminant inventory, or corrected locations for sites not properly located during the primary contaminant inventory. Enhanced inventory sites can also include miscellaneous sites added by the Idaho Department of Environmental Quality (DEQ) during the primary contaminant inventory.

Floodplain – This is a coverage of the 100-year floodplains.

Group 1 Sites – These are sites that show elevated levels of contaminants and are not within the priority one areas.

Inorganic Priority Area – Priority one areas where greater than 25% of the wells/springs show constituents higher than primary standards or other health standards.

Landfill – Areas of open and closed municipal and non-municipal landfills.

LUST (Leaking Underground Storage Tank) – Potential contaminant source sites associated with leaking underground storage tanks as regulated under RCRA.

Mines and Quarries – Mines and quarries permitted through the Idaho Department of Lands.)

Nitrate Priority Area – Area where greater than 25% of wells/springs show nitrate values above 5mg/l.

NPDES (National Pollutant Discharge Elimination System) – Sites with NPDES permits. The Clean Water Act requires that any discharge of a pollutant to waters of the United States from a point source must be authorized by an NPDES permit.

Organic Priority Areas – These are any areas where greater than 25% of wells/springs show levels greater than 1% of the primary standard or other health standards.

Recharge Point – This includes active, proposed, and possible recharge sites on the Snake River Plain.

RCRA – Site regulated under **Resource Conservation Recovery Act (RCRA)**. RCRA is commonly associated with the cradle to grave management approach for generation, storage, and disposal of hazardous wastes.

SARA Tier II (Superfund Amendments and Reauthorization Act Tier II Facilities) – These sites store certain types and amounts of hazardous materials and must be identified under the Community Right to Know Act.

Toxic Release Inventory (TRI) – The toxic release inventory list was developed as part of the Emergency Planning and Community Right to Know (Community Right to Know) Act passed in 1986. The Community Right to Know Act requires the reporting of any release of a chemical found on the TRI list.

UST (Underground Storage Tank) – Potential contaminant source sites associated with underground storage tanks regulated as regulated under RCRA.

Wastewater Land Applications Sites – These are areas where the land application of municipal or industrial wastewater is permitted by DEQ.

Wellheads – These are drinking water well locations regulated under the Safe Drinking Water Act. They are not treated as potential contaminant sources.

NOTE: Many of the potential contaminant sources were located using a geocoding program where mailing addresses are used to locate a facility. Field verification of potential contaminant sources is an important element of an enhanced inventory.

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Appendix A

Agrium Potential Contaminant Inventory
Figures 2, 3, and 4
Tables A-1, A-2, and A-3

FIGURE 2. Agrium Delineation Map and Potential Contaminant Source Locations

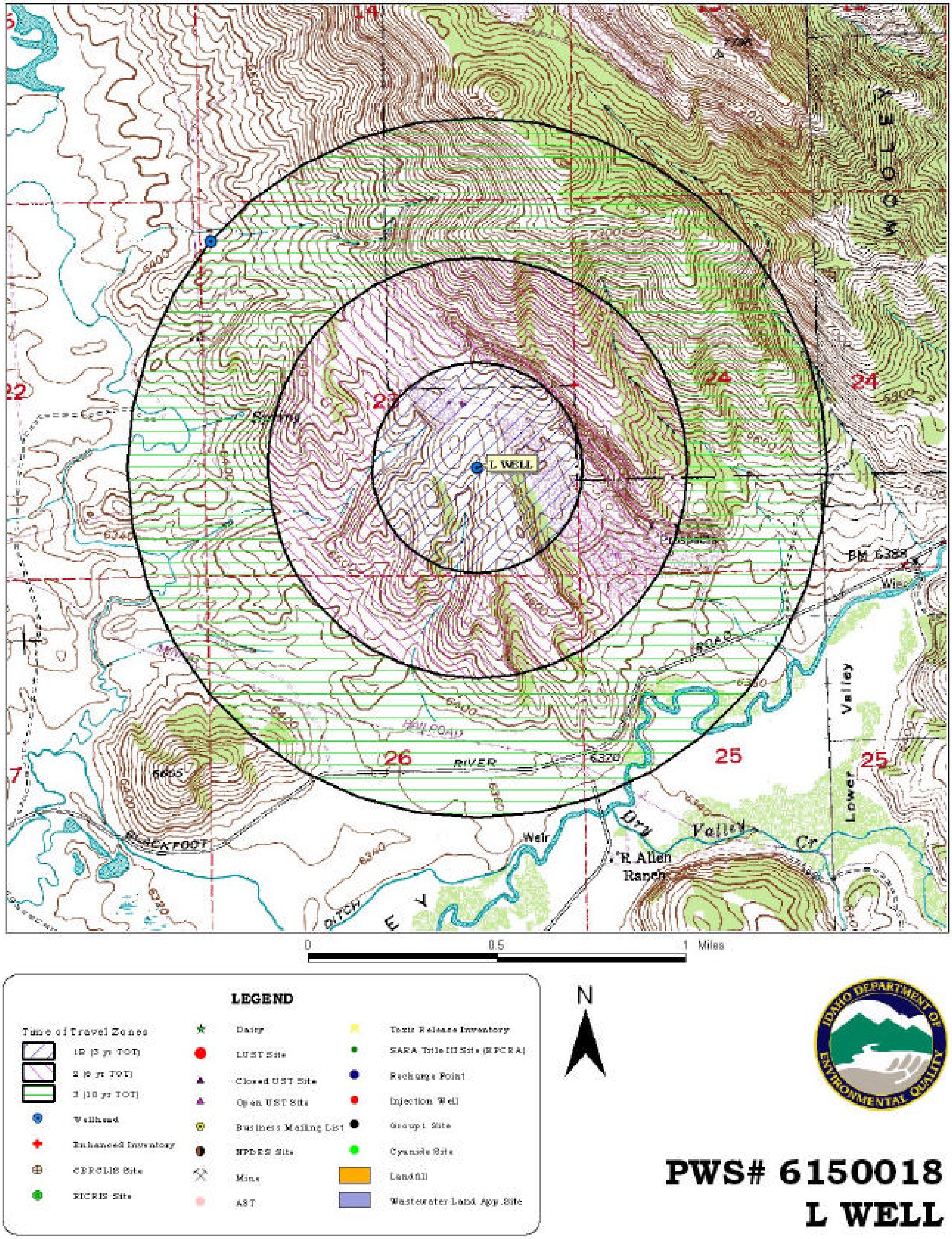
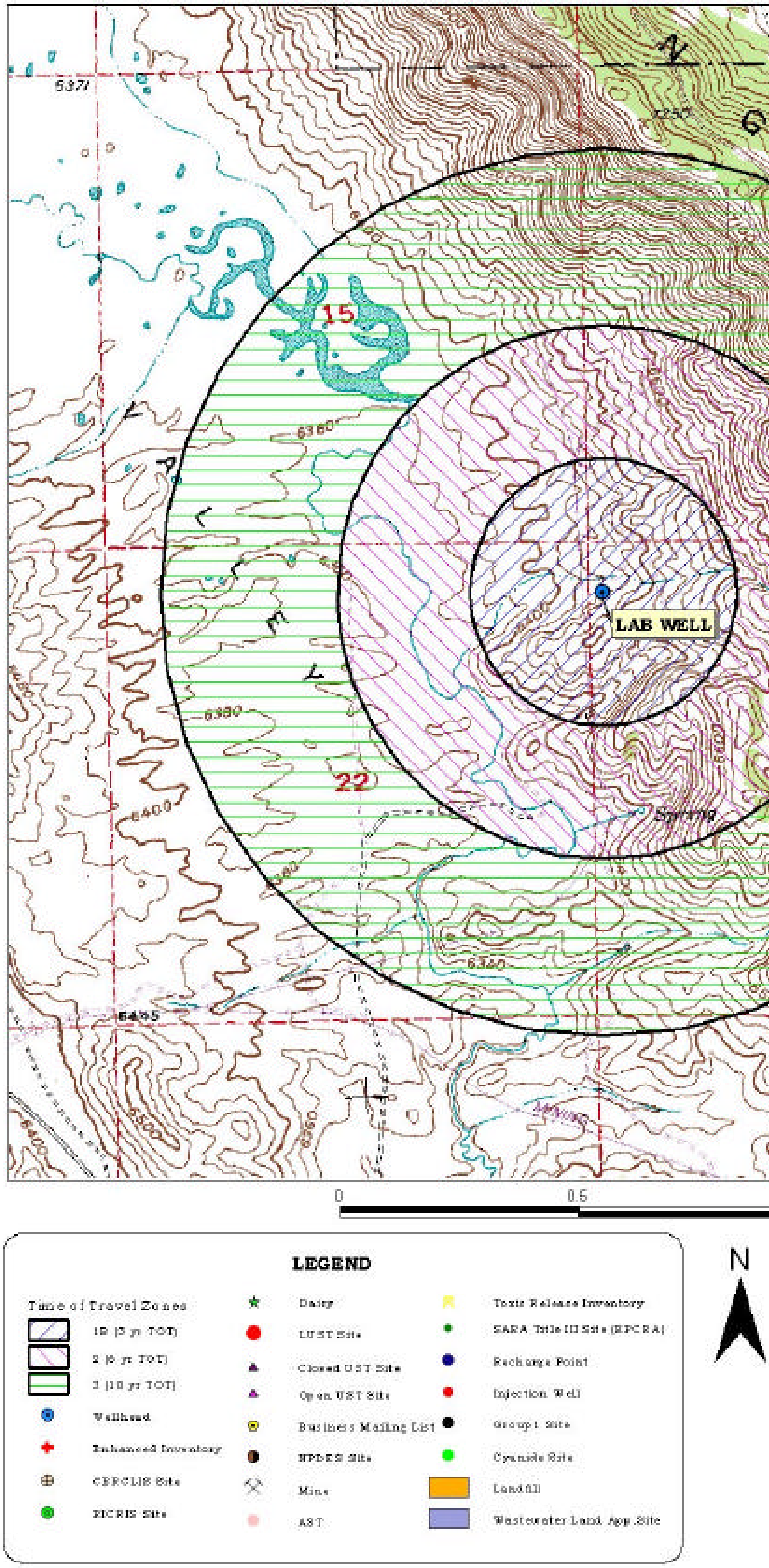
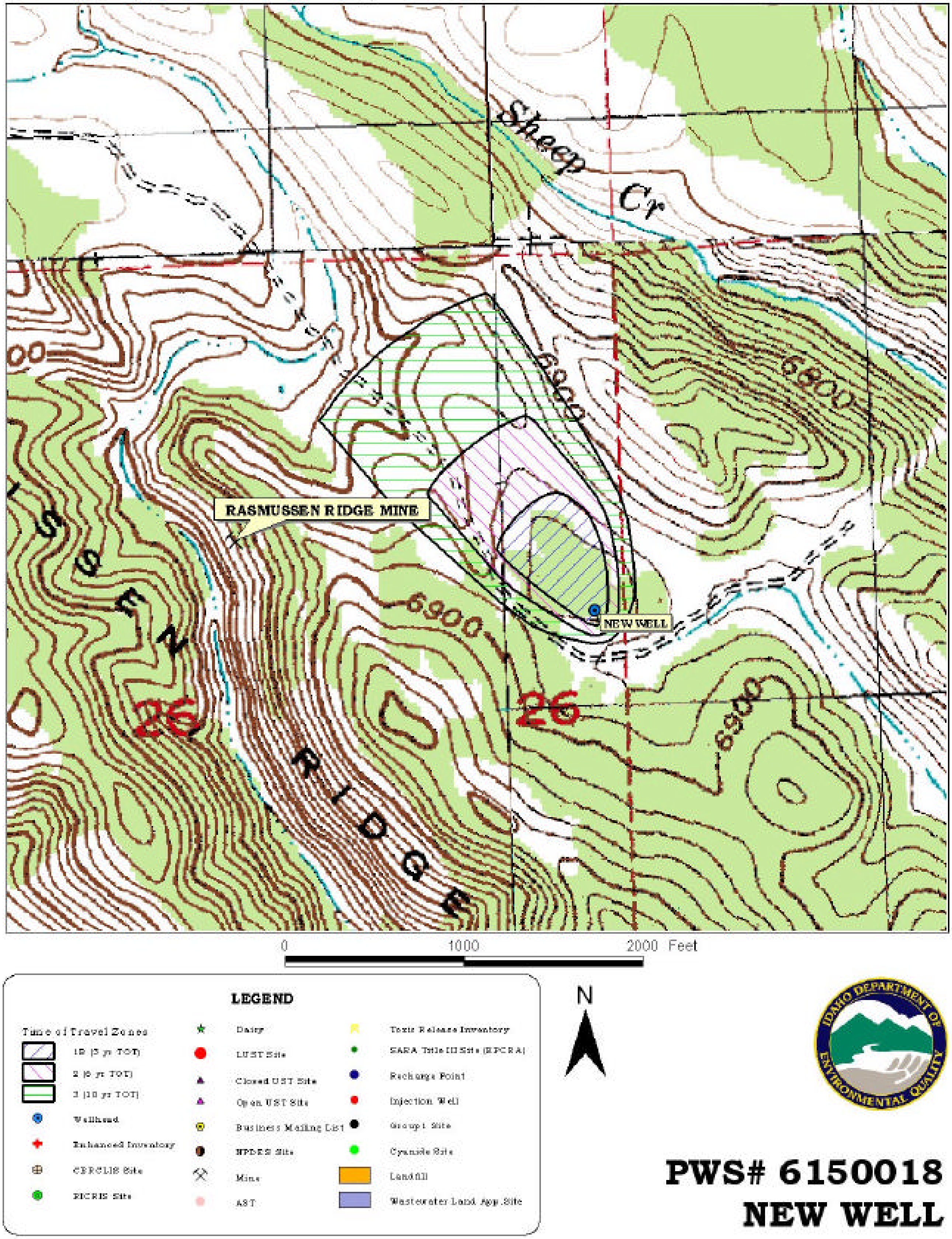


FIGURE 3. Agrium Delineation Map and Potential Contaminant Source Locations



PWS# 6150018
LAB WELL

FIGURE 4. Agrium Delineation Map and Potential Contaminant Source Locations



PWS# 6150018
NEW WELL

Table A-1. Agrium, L Well, Potential Contaminant Inventory

Site #	Source Description	TOT Zone (years)	Source of Information	Potential Contaminants[1]
	Blackfoot River Road	6-10	GIS Map	IOC, VOC, SOC
	Blackfoot River	6-10	GIS Map	IOC, VOC, SOC

[1] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table A-2. Agrium, Lab Well, Potential Contaminant Inventory

Site #	Source Description	TOT Zone (years)	Source of Information	Potential Contaminants[1]
	Intermittent Stream	0-3	GIS Map	IOC, VOC, SOC, Microbials
	Jeep Trail	3-6, 6-10	GIS Map	IOC, VOC, SOC

[1] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

Table A-3. Agrium, New Well, Potential Contaminant Inventory

Site #	Source Description	TOT Zone (years)	Source of Information	Potential Contaminants[1]
	Driveway	0-3 (1A)[2]	Sanitary Survey	IOC, VOC, SOC, Microbials
	Jeep Trail	3-6, 6-10	GIS Map	IOC, VOC, SOC
	Rasmussen Ridge Mine	0-3	2002 ESA	IOC, VOC, SOC
	Rasmussen Ridge Mine	3-6, 6-10	2002 ESA	IOC, VOC, SOC

[1] IOC = inorganic chemical, VOC = volatile organic chemical, SOC = synthetic organic chemical

[2] 1A = potential contaminant source located within the 50-foot sanitary setback distance of the wellhead

Appendix B

Agrium

Susceptibility Analysis Worksheets

Susceptibility Analysis Formulas

The final scores for the susceptibility analysis were determined using the following formulas:

1) VOC/SOC/IOC Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.2)

2) Microbial Final Score = Hydrologic Sensitivity + System Construction + (Potential Contaminant/Land Use x 0.375)

Final Susceptibility Scoring:

0 - 5 Low Susceptibility

6 - 12 Moderate Susceptibility

≥ 13 High Susceptibility

Ground Water Susceptibility Report   Public Water System Name : AGRIUM   Well# : L WELL

Public Water System Number 6150018   11/7/2002 7:23:43 AM

1. System Construction		SCORE
Drill Date	1/1/1968	
Driller Log Available	NO	
Sanitary Survey (if yes, indicate date of last survey)	NO	0
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	NO	1
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	NO	1
Well located outside the 100 year flood plain	YES	0
	Total System Construction Score	5

2. Hydrologic Sensitivity		
Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	YES	1
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	NO	2
	Total Hydrologic Score	6

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
	Total Potential Contaminant Source/Land Use Score - Zone 1A	0	0	2	0
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	NO	0	0	0	0
(Score = # Sources X 2) 8 Points Maximum		0	0	0	0
Sources of Class II or III leacheable contaminants or	NO	0	0	0	
4 Points Maximum		0	0	0	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
	Total Potential Contaminant Source / Land Use Score - Zone 1B	0	0	0	0
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Less than 25% Agricultural Land	0	0	0	
	Potential Contaminant Source / Land Use Score - Zone II	3	3	3	0
Potential Contaminant / Land Use - ZONE III					
Contaminant Source Present	YES	1	1	1	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	
	Total Potential Contaminant Source / Land Use Score - Zone III	2	2	2	0
Cumulative Potential Contaminant / Land Use Score		5	5	7	0
4. Final Susceptibility Source Score		12	12	12	11
5. Final Well Ranking		Moderate	Moderate	Moderate	Moderate

Ground Water Susceptibility Report   Public Water System Name : AGRIUM   Well# : LAB WELL

Public Water System Number 6150018   11/7/2002 7:24:14 AM

1. System Construction

		SCORE
Drill Date	8/22/1967	
Driller Log Available	NO	
Sanitary Survey (if yes, indicate date of last survey)	NO	0
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	NO	1
Casing and annular seal extend to low permeability unit	NO	2
Highest production 100 feet below static water level	YES	0
Well located outside the 100 year flood plain	YES	0
Total System Construction Score		4

2. Hydrologic Sensitivity

Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	YES	1
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	NO	2
Total Hydrologic Score		6

3. Potential Contaminant / Land Use - ZONE 1A

		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	NO	NO	NO	NO	NO
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0

Potential Contaminant / Land Use - ZONE 1B

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant sources present (Number of Sources)	YES	1	1	1	1
(Score = # Sources X 2) 8 Points Maximum		2	2	2	2
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
4 Points Maximum		1	1	1	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	3	3	2

Potential Contaminant / Land Use - ZONE II

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Less than 25% Agricultural Land	0	0	0	
Potential Contaminant Source / Land Use Score - Zone II		3	3	3	0

Potential Contaminant / Land Use - ZONE III

		IOC Score	VOC Score	SOC Score	Microbial Score
Contaminant Source Present	YES	1	1	1	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		2	2	2	0

	IOC	VOC	SOC	Microbial
Cumulative Potential Contaminant / Land Use Score	8	8	10	2
4. Final Susceptibility Source Score	12	12	12	11
5. Final Well Ranking	Moderate	Moderate	Moderate	Moderate

Ground Water Susceptibility Report   Public Water System Name : AGRIUM   Well# : NEW WELL

Public Water System Number 6150018   11/7/2002 7:24:37 AM

1. System Construction		SCORE
Drill Date	3/1/1990	
Driller Log Available	YES	
Sanitary Survey (if yes, indicate date of last survey)	YES	1999
Well meets IDWR construction standards	NO	1
Wellhead and surface seal maintained	YES	0
Casing and annular seal extend to low permeability unit	YES	0
Highest production 100 feet below static water level	NO	1
Well located outside the 100 year flood plain	YES	0
Total System Construction Score		2

2. Hydrologic Sensitivity		
Soils are poorly to moderately drained	NO	2
Vadose zone composed of gravel, fractured rock or unknown	NO	0
Depth to first water > 300 feet	NO	1
Aquitard present with > 50 feet cumulative thickness	YES	0
Total Hydrologic Score		3

3. Potential Contaminant / Land Use - ZONE 1A		IOC Score	VOC Score	SOC Score	Microbial Score
Land Use Zone 1A	RANGELAND, WOODLAND, BASALT	0	0	0	0
Farm chemical use high	YES	0	0	2	
IOC, VOC, SOC, or Microbial sources in Zone 1A	YES	YES	YES	YES	YES
Total Potential Contaminant Source/Land Use Score - Zone 1A		0	0	2	0
Potential Contaminant / Land Use - ZONE 1B					
Contaminant sources present (Number of Sources)	NO	1	1	1	0
(Score = # Sources X 2) 8 Points Maximum		2	2	2	0
Sources of Class II or III leacheable contaminants or	NO	1	1	1	
4 Points Maximum		1	1	1	
Zone 1B contains or intercepts a Group 1 Area	NO	0	0	0	0
Land use Zone 1B	Less Than 25% Agricultural Land	0	0	0	0
Total Potential Contaminant Source / Land Use Score - Zone 1B		3	3	3	0
Potential Contaminant / Land Use - ZONE II					
Contaminant Sources Present	YES	2	2	2	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Land Use Zone II	Less than 25% Agricultural Land	0	0	0	
Potential Contaminant Source / Land Use Score - Zone II		3	3	3	0
Potential Contaminant / Land Use - ZONE III					
Contaminant Source Present	YES	1	1	1	
Sources of Class II or III leacheable contaminants or	YES	1	1	1	
Is there irrigated agricultural lands that occupy > 50% of	NO	0	0	0	
Total Potential Contaminant Source / Land Use Score - Zone III		2	2	2	0
Cumulative Potential Contaminant / Land Use Score		8	8	10	0
4. Final Susceptibility Source Score		7	7	7	0
5. Final Well Ranking		High	High	High	High